4 October 1984

MEMORANDUM FOR THE RECORD

SUBJECT: [redacted] remarks on Soviet science STAT

On Tuesday, 2 October 1984, [redacted] I met with [redacted] STAT
[redacted] at Princeton, to get [redacted] comments on STAT
Soviet science. The following is a somewhat edited summary of the conversation.

General remarks on the project:

[redacted] thinks that this is a very worthy enterprise, and that it should be done as publicly as possible. He has a friend at the New York TIMES, and was thinking himself about writing something for them on the subject. [redacted] thinks that for each of the topical fields we are going to assess, we should write up a 20-25 page evaluation and then circulate that to US experts in the subject, for their critical commentary. STAT STAT

General remarks on Soviet science:

There are a few dangers in interviewing US experts, similar to dangers associated with the FASAC panel evaluation efforts. It's easy to get lost in detail, and it's easy to simply get back what you already know. Also, "People tend to tell you that, in their own field, Soviet science is very poor, 'but in this other field, which I know less about, they are very strong!'. Everybody says this!"

The Soviets are becoming very conscious of computers..."The computer business, automation, is a big deal now." People high up in the scientific bureaucracy (like Marchuk and his subordinates) have a strong computer background. The choice of these people as leaders is not accidental! [redacted] thinks that by looking at the scientific leadership in the USSR, their backgrounds and interests, one can predict the fields of future Soviet emphasis and fields which the Soviets consider important. [redacted] notes that the top scientific leadership tends to come from Novosibirsk, like Marchuk did; he sees stagnation in Moscow and Leningrad. STAT STAT

A theme which [redacted] returned to several times is the demographic one: Soviet science is dominated by old men. As Lavrent'yev said to him, in response to a question about why Soviet organic chemistry was so poor, "Our Academicians live too long!" There is no room for new blood. The dominance of elder scientists was less harmful when the scientific establishment was expanding rapidly, but now, with expansion stopping, it's bad. With the passing from the scene of these older leaders, new life may be pumped into Soviet science.

The Soviets are constrained in that they can't fire anybody, however mediocre, from a laboratory or other scientific institute. In the US, there is a lot more turnover, especially at the postdoc level. There is also far more flexibility to enter new fields in the US. Industrial labs keep pushing the US academic researchers on to new frontiers. Also, funding agencies in the US tend to cut off money after 4-5 years of work in one narrow area. Soviet research groups tend to be massive. There are groups with 200 people under one professor, doing detail work on well-defined projects. "The top people have flexibility; younger ones don't have a chance."

[redacted] asks, "Is the Soviet Union like Japan, before the War? That is, shoddy results, pedestrian work, details but no new ideas? Could the Soviet Union 'turn around' like Japan did?"

[redacted] finds the sociology of Soviet science interesting. For instance, at the time of the Revolution, there were millions of people in the Church; now there are only a few thousand. There were a few thousand scientists; now there are 1.8 million, according to Soviet figures. Many people who would have gone into the clergy went into science; it tended to take an extra generation,though, for peasants to transition into scientists. The Jewish people had a tradition of education and moved into the sciences rapidly.

Concerning the Soviet educational system, [redacted] sees it as a somewhat overemphasized factor in scientific accomplishment. He said that one needs a certain minimum threshold of education, and from then on, it depends on individuals and inspiration by exceptional teachers. One really should not judge by averages--it's the brilliant students that count! The Soviet mathematics olympiads, instituted by Lavrent'yev, were an effort to identify and cultivate some of the mathematical prodigies...but the bright kids selected weren't given any discipline, and the program wasn't particularly successful. [redacted] mentioned that this seemed to be the problem with Caltech; it came out later on that he had graduated from there [redacted]

In the US some of the best grad students come not from the Harvard/Yale/Princeton/etc. circuit, but from small (but good) schools. So, [redacted] concluded that it's hard to tell, and may not be too relevant, what the educational system produces. Again, he said, what counts is the bright guys. There's the problem of

late-bloomers, too; the Soviet system may select against them. We should try to look at Soviets who have been to US in the exchange programs, and get comments on how they were as students here, and how they are doing now.

An interesting idea, which [redacted] credited to DeSolla Price: "Excellence is the square root of the total number of good people!" That is, you really only want to look at the upper tail of the distribution; out of a million scientists, that's a thousand or so. ([redacted] Lemma: "The bastards are also the square root!") In answer to a question [redacted] on how research topics are decided in the Soviet Union, [redacted] said "Ten years ago, the Soviets did an overall review of Western science, and decided which things should be pushed. They then made detailed plans as to what to do." In general, economics governs Soviet science. The Soviets face a West which is making rapid technological strides. The Soviets take a long time to assimilate Western technology. They have demographic problems, and have to raise hard currency by exporting oil, gold, timber, and other raw materials. STAT STAT STAT STAT

One should watch the key committees to see how Soviet research programs begin. For each important field, there are committees in the ANSSSR and the GKNT, composed of scientists and engineers. The committees have annual meetings and hear seminars about research in their field. When the committees make recommendations, that carries a lot of weight.

Concerning instrumentation and Soviet science, [redacted] said there are examples of clever insights and new ways of using old tools, but basically "building standard instrumentation is a losing game! No body in the US builds standard equipment any more. One designs new apparatus, which industry takes up and builds." The Soviet's lack of a market for instrumentation production and distribution therefore really hurts them. STAT

Even given good instrumentation, the identical equipment bought from the West, "The same instrument in the West goes farther by an order of magnitude than in the USSR." ([redacted] qualifies this as maybe only true in the chemical fields which he knows best. ) The Soviets don't seem to push as hard to get the maximum out of their equipment. The Soviets also suffer, in comparison with the US, from a lack of centers of excellence in instrumentation. We have good instruments spread all over the country, so scientists can make deals and share resources which they couldn't individually afford to buy/build. A specific example [redacted] gave was an electron microscope, which got 10 Angstrom resolution in the USSR, and 2 Angstrom here. STAT STAT

Over lunch, [redacted] mentioned that he thought bio-engineering was a field important to watch Soviet developments in. I don't have any notes or further information on that. STAT

Concerning chemistry in the Soviet Union:

[redacted] recommended taking the article "Chemistry in the USSR" from Uspekhi Khemii, which surveys the field as of a few years ago, and getting critical commentary on it from US experts. It was written for the 60th anniversary of the USSR, has a lot of laudatory comments, but also includes a detailed, field-by-field, discussion of research work: who, what, where, etc. [redacted] looked for, but hasn't found, similar overviews in other fields of science.

The Soviets focus on certain fields, such a magnetic resonance, and do a great deal of detailed work. They have many machines and use them heavily, though the quality may not be as high as the best in the West. Catalysis, another field which the Soviets have identified as important, seems to have somebody working in every sub-field. [redacted] doesn't see a lot of innovation, however...the work is usually pedestrian. Occasional good ideas aren't followed-up in the USSR, at least not beyond the immediate implications, until the West has taken them up.

In the US, there are big industrial companies (Union Carbide, Mobil, etc.) with huge in-house labs to translate ideas into applications. This is lacking in the USSR. [redacted] the Soviet military establishment may be an exception here...perhaps due to the market sort of approach which the military uniquely has in the USSR.)

[redacted] noted that the czar of Soviet catalysis, Boreskov(?), died on 12 August 84; a 45-year-old (Zamarayev?) replaced him. Possibly there will be a "quantum jump in Soviet activity, as old leaders die off". [redacted] pointed out that "In spite of the massive Soviet approach to chemistry, they haven't produced a single industrial process!" [redacted] gave a specific example, involving ethelene oxidation, where a good piece of Soviet basic research was jumped on by US and West Germany and translated into a production plant in 6 years. "The Soviets missed the boat completely!"

In chemistry, at least, [redacted] blames the scientific managerial process in the USSR. It's very hard to find a new process that pays off, considering the massive investment usually required to go from laboratory to production plant scale. The Soviets can't shut down production of a plant to change things, "because it would take them 4 years to restart!" If a change involves capital construction costs, it's very tough to get it done in the USSR (military excluded). Incremental upgrades might have a chance. But for the next 10-20 years, [redacted] doesn't see significant Soviet process in industrial developments.

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